

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

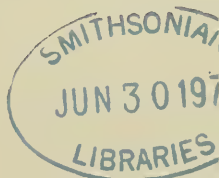
A NEW CRAWFISH OF THE SPICULIFER GROUP
OF THE GENUS *PROCAMBARUS* (DECAPODA,
ASTACIDAE) FROM CENTRAL MISSISSIPPI

BY J. F. FITZPATRICK, JR. AND HORTON H. HOBBS, JR.
Randolph-Macon Woman's College, Lynchburg, Virginia
24504 and Department of Invertebrate Zoology,
Smithsonian Institution, Washington, D.C. 20560

The members of the Spiculifer Group of the crawfish genus *Procambarus* inhabit lotic habitats in the Coastal Plain and Piedmont provinces of the southeastern United States. Although only five of the 15 described species have allopatric ranges, only four species have been previously reported as occurring in the same locality with another member of the Group: *P. elegans* Hobbs, 1969: 329, and *P. vioscai* Penn, 1946: 27, in Louisiana, and *P. spiculifer* (LeConte, 1856: 401) and *P. versutus* (Hagen, 1870: 51) in Alabama and Florida (Hobbs, 1969: 347). To such associations we can now add that of *P. spiculifer* and *P. raneyi* Hobbs, 1953: 412, in Big Flat Creek, a tributary to the Alcovy River, Walton County, Georgia. The range of the species described here, while seemingly allopatric, is almost completely surrounded by that of a yet undescribed member of the group which fills the apparent hiatus in the range between *P. ablusus* Penn, 1963: 121, and other species of the group: *P. versutus* and *P. lagniappe* Black, 1968: 5, to the east; *P. penni* Hobbs, 1951: 273, to the south; and *P. vioscai* to the west.

***Procambarus lylei* new species**
(Figures 1-14)

Diagnosis: Body pigmented, eyes well-developed. Rostrum with convergent margins bearing pair of marginal spines; acumen long and slender. Areola 2.5 to 5.3 times longer than wide and constituting 25.0 to 30.2 percent of entire length of carapace. Carapace with two cervical spines

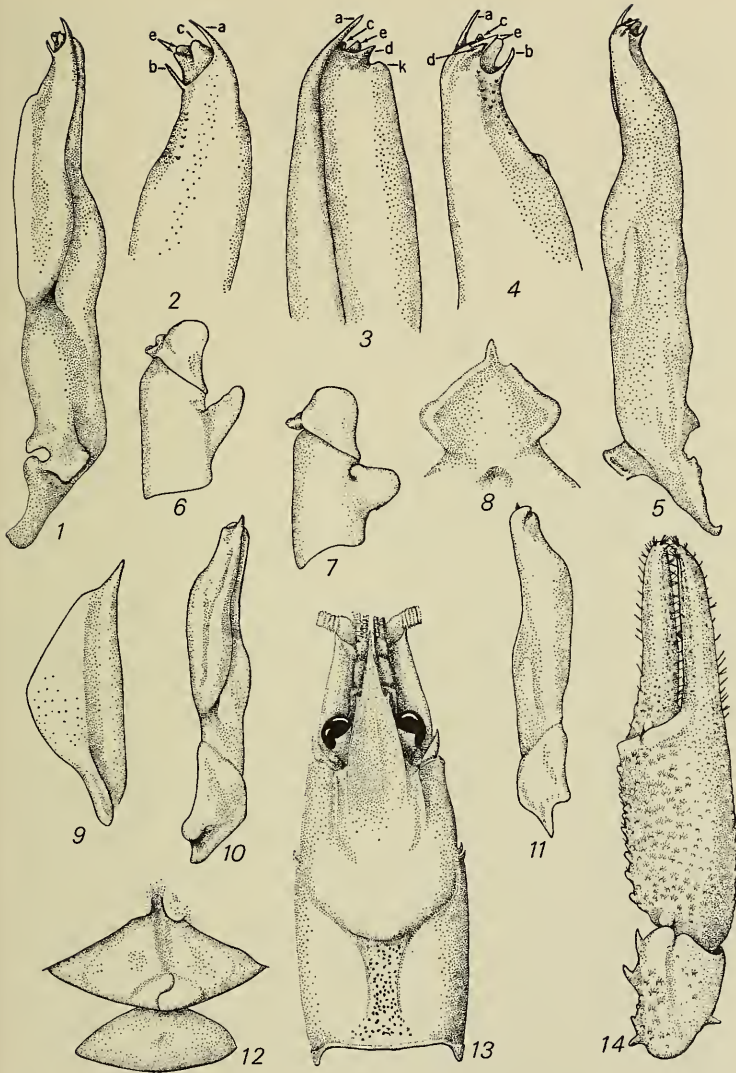


on each side. Suborbital angle obsolete. Postorbital ridges terminating in spines. Antennal scale approximately 2.3 times longer than wide, broadest proximal to midlength. Mesial margin of palm with seven or eight tubercles, and both fingers provided with moderately well-defined longitudinal ridges. Ischia of third and fourth pereopods with hooks, those of the third markedly more acute; coxae of fourth and fifth pereopods with prominences. First pleopods asymmetrical, with weakly defined shoulder on cephalic surface, reaching cephalad to cephalic margin of coxae of third pereopods, and provided with subterminal setae; distal extremity bearing five elements: (1) slender acute mesial process, (2) shorter but slender and acute cephalic process, (3) rounded, unobtrusive caudal knob bearing strong caudal process medially, (4) short, corneous central projection, and (5) stout, broadly subtriangular adventitious process situated cephalomesial to central projection extending subparallel to it but not quite so far distally; all terminal elements recurved cephalodistally; cephalic process not visible in caudal aspect of appendage.

Holotypic male, Form I: Body subovate. Abdomen narrower than thorax (13.2 and 14.6 mm). Width of carapace slightly greater than height at caudodorsal margin of cervical groove (14.6 and 14.0 mm). Areola 4.1 times longer than wide with four or five punctations across narrowest part. Cephalic section of carapace 2.7 times as long as areola (latter 27.7 percent of entire length of carapace). Rostrum excavate dorsally with unthickened margins subparallel at base but becoming convergent at level of caudal margin of orbit; upper surface of rostrum with usual submarginal setiferous punctations and others scattered sparsely between; well-developed marginal spines present at base of acumen; acumen long and spiniform, constituting approximately 39 percent of entire length of rostrum. Subrostral ridges weak and scarcely visible in dorsal aspect. Postorbital ridges prominent, grooved dorso-laterally, and terminating cephalically in strong acute spines. Suborbital angle obsolete. Branchiostegal spine prominent and acute. Carapace punctate dorsally, tuberculate cephalolaterally, and granulate ventrolaterally. Two cervical spines present on each side of carapace subequal in size. Abdomen longer than carapace (34.9 and 33.3 mm). Cephalic section of telson with three spines in right and four in left caudolateral corner. Epistome (Fig. 8) about as broad as long; margins slightly elevated and converging to subacute apical projection. Antennules of

→

FIGS. 1-14. *Procambarus lylei* new species (pubescence removed from all structures illustrated). 1, Mesial view of first sinistral pleopod of holotype. 2, Cephalomesial aspect of apical portion of first pleopod of holotype. 3, Caudal aspect of apical portion of first pleopod of holotype. 4, Lateral aspect of apical portion of first pleopod of holotype. 5, Lateral view of first pleopod of holotype. 6, Basipodite and ischiopodite of third pereopod of holotype. 7, Basipodite and ischiopodite of fourth pereopod of holotype. 8, Epistome of holotype. 9, Antennal scale of holotype. 10,



Mesial view of first pleopod of morphotype. 11, Lateral view of first pleopod of morphotype. 12, Annulus ventralis of allotype. 13, Dorsal view of carapace of holotype. 14, Dorsal view of distal podomeres of cheliped of holotype. Abbreviations—*a*, mesial process; *b*, cephalic process; *c*, adventitious process; *d*, caudal process; *e*, central projection; *k*, caudal knob.

TABLE 1. Measurements (mm) of *Procambarus lylei*.

	Holotype	Allotype	Morphotype
Carapace:			
Height	14.0	13.9	11.1
Width	14.6	12.9	9.3
Length	33.3	31.5	24.4
Areola:			
Width	2.2	3.4	2.0
Length	9.1	8.4	6.1
Rostrum:			
Width	4.8	5.0	3.8
Length	13.8	12.9	10.5
Left chela:			
Length of inner margin of palm	11.6	5.5	5.1
Width of palm	7.2	4.5	3.1
Length of outer margin of chela	25.3	13.8	11.4
Length of dactyl	11.9	7.2	6.1

usual form with prominent spine on ventral surface of basal third of proximal segment. Antennae broken, length indeterminate. Antennal scale (Fig. 9) about 2.3 times longer than broad, broadest proximal to midlength with widest lamellar area 1.9 times wider than thickened lateral portion, latter terminating in strong acute spine.

Right chela (Fig. 14) moderately depressed with palm somewhat inflated; lateral margin with row of squamous tubercles along proximal half; upper and lower surfaces of palm with numerous tubercles, mesial margin with row of eight tubercles subtended dorsolaterally by irregular row of about nine less prominent tubercles, lower surface without prominent tubercle at base of dactyl. Fixed finger with moderately well-defined, submedian dorsal ridges flanked by setiferous punctations; opposable margin with row of five small and one prominent tubercle in basal half and crowded minute denticles along almost entire length; lower surface with moderately prominent, submedian, longitudinal ridge flanked by setiferous punctations. Dactyl with weak submedian ridge flanked by setiferous punctations above and below; mesial surface with 12 tubercles arranged in three irregular rows in proximal third and setiferous punctations distally; proximal half of opposable margin with upper row of six subequal tubercles and more prominent lower row of one small, one large, and two small tubercles, and with crowded minute denticles along almost entire length.

Carpus of right cheliped longer than broad (8.0 and 4.7 mm), with mesial and dorsomesial areas tuberculate, and area lateral to dorsal

diagonal furrow mostly punctate; distal dorsomesial surface with one prominent spine; mesial surface with one spiniform tubercle near mid-length and several smaller tubercles proximal to it; proximal dorsomesial surface with less acute and smaller spiniform tubercle; lower surface with two distal spines, lateral one on ventral articular condyle and other more mesially situated.

Merus of right cheliped punctate over most of surface; upper margin with row of six spiniform tubercles in proximal half becoming double row of seven each in distal half, most distal in each row strong and acute; lower lateral margin with row of 11 spiniform tubercles and mesial row of 13. Ischium with row of one large and two small spiniform tubercles on mesial surface.

Hooks on ischia of third and fourth pereopods (Figs. 6, 7) simple, that on fourth somewhat bulbous. Coxa of fourth pereopod with prominent rounded boss caudomesially; that of fifth with small slender projection ventrolateral to penis papilla.

Sternum between second through fifth pereopods moderately deep and bearing prominent fringe of setae on ventrolateral margins.

First pleopods (Figs. 1-5) as described in diagnosis.

Morphotypic male, Form II: Subadult male. Differences from holotype minor except in chela and first pleopod. Chela markedly shorter and less tuberculate; mesial margin of palm with row of seven tubercles subtended dorsolaterally by row of only three poorly developed tubercles; tubercles on opposable margins of fingers much reduced; right chela missing. (See measurements.) First pleopod (Figs. 10, 11) reaching only to middle of coxa of third pereopod; terminal elements non-corneous, subparallel to main axis of shaft of pleopod, and restricted to stoutly acute mesial process, blunt caudal knob, and central projection; suture clearly delimiting basal segment. Coxa of fourth pereopod lacking boss; ventromesial projection of coxa of fifth pereopod much less developed and more ventral in position than in holotype. Third pereopods missing.

Allotypic female: Differing from holotype principally in secondary sexual characters. Abdomen proportionately much wider as compared with width of carapace (11.8 and 12.9 mm). Chela shorter and stouter; submedian ridges of fingers less pronounced; dactyl with only one large tubercle in proximal region of antepenultimate fourth of lower opposable margin and upper row of five subequal tubercles; tubercles of upper and lower surfaces of palm much reduced. Antennae reaching fourth abdominal tergum. (See measurements.)

Annulus ventralis (Fig. 12) movable, with shallow submedian trough in cephalic two-thirds; sinus originating in caudal portion of trough and winding in reversed sigmoid curve to caudal margin of annulus, bisecting rounded caudal eminence; remainder of ventral surface nearly plane. Thoracic sternum lacking deep excavation and not conspicuously setose; sternum overhanging cephalic margin of annulus ventralis and with one pair of caudally projecting tubercles.

Type-locality: Shutispear Creek, 2.7 miles south of State Route 8 on

State Route 9, Calhoun County, Mississippi. At the time of the collection, the stream had a sluggish current and a bottom of sticky mud, on which there were sticks and other detritus. The stream was some five feet in width, three feet deep, and was surrounded by wooded banks, the preponderant element of which was *Salix nigra* Marsh.

Disposition of types: The holotypic male, Form I, the allotypic female, and the morphotypic male, Form II, are in the collection of the National Museum of Natural History, Smithsonian Institution, nos. 131533, 131534, and 131535, respectively. Topoparatypes and paratypes are in the personal collection of the senior author.

Range and crawfish associates: *Procambarus lylei* is known from only two localities in Calhoun County, Mississippi, both in the Yalobusha River drainage: type-locality, 2 April 1966 (1 ♂ I, 2 ♂ II, 3 ♀, 6 juv. ♂, 3 juv. ♀), L. E. Fleming and J. F. Fitzpatrick, Jr., coll., with *P. a. acutus* (Girard, 1852: 91), *P. hayi* (Faxon, 1884: 108), *Cambarus diogenes* subsp., and an undescribed species of *Orconectes*. Toposhaw Creek, 1.9 miles west of Calhoun City (junction State Route 9) on State Route 8, 4 August 1967 (2 ♀), S. M. Chien and W. G. Anding, coll., with *P. a. acutus*, *P. hayi*, and an undescribed species of *Orconectes*. Diligent search of the area has not revealed additional localities in which the species occurs.

Variation and size: Aside from the usual variations associated with sex and maturity, few significant variations were encountered. The fourth spine in the left caudolateral corner of the cephalic section of the telson of the holotype is clearly an accessory spine, appearing only in this specimen. Three females which are larger than the allotype have the cephalolateral margins of the annulus ventralis elevated, the degree of elevation apparently increasing with size; in juvenile specimens, the annulus is proportionately shorter, apparently resulting from lesser development of the cephalic portion. One female possesses an accessory tubercle cephalic to the left tubercle on the sternum cephalic to the annulus. One of the larger females has chelae which are longer and more slender than those of the other females, and the palm is more strongly tuberculate. Although we possess too few specimens for establishing a definite correlation, the width of the areola (expressed as a ratio of its length) seems inversely related to cephalothorax length. The row of tubercles that subtends the mesialmost row on the palm is irregular and variable in number (two to nine in mature specimens). The largest specimen is a female of 52.3 mm cephalothorax length; the next largest specimen is also a female with a corresponding length of 39.4 mm.

Relationships: *Procambarus lylei* is most closely related to *P. ablusus*, *P. elegans* Hobbs, 1969: 329, and *P. natchitochae* Penn, 1953: 5, with which it shares a simple but complete complement of terminal elements on the first pleopod of the male and a relatively unornamented caudal margin of the thoracic sternum in the female. As in *P. elegans*, a prominent caudal process arises distinctly from the caudal knob, and, considering that all of the known females of *P. elegans* are juvenile, the annuli

ventrales are very similar in shape and configuration as are the sterna immediately cephalic to the annuli. Too, in *P. elegans* there is a distinct hint of the cephalic curvature of the distal portion of the first pleopod of the male that is characteristic of *P. lylei*. In both species, the subapical tuft of setae arises principally from the cephalic surface of the appendage. Similarly, *P. natchitochae* is probably closer to *P. lylei* than is *P. ablusus*. *Procambarus penni* and *P. vioscai* are less closely related; in the former, the caudal knob fuses imperceptibly with the caudal process, and the sternum immediately cephalic to the annulus is multituberculate; the latter species is easily distinguished from *P. lylei* by its stout, decidedly non-setiform cephalic process and by the marked flexure of the mesial process. In other members of the Spiculifer Group that retain the cephalic process on the first pleopod, the sternum of the female is multituberculate, and, in some, extends caudad well past the midlength of the annulus. Only *P. lylei* of this group of crawfishes exhibits the marked cephalodistal curvature of all terminal elements of the first pleopod of the male, and it is unique among the members of the Spiculifer Group in possessing a distinct shoulder on the cephalic margin of the pleopod. The subterminal setae arise from as far proximally as the level of this shoulder but do not occur on it.

Etymology: We are pleased to name this new crawfish in honor of Dr. Clay Lyle in recognition of his work with Mississippi crawfishes.

Acknowledgments: We wish to thank W. G. Anding, S. M. Chien, and L. E. Fleming for assistance in field work and Fenner A. Chace, Jr., and Raymond B. Manning for their criticisms of the manuscript.

LITERATURE CITED

- BLACK, JOE B. 1968. A new crawfish of the genus *Procambarus* from Mississippi (Decapoda, Astacidae). *Tulane Studies in Zool. and Botany* 15(1): 5-9, 12 figs.
- FAXON, WALTER. 1884. Descriptions of new species of *Cambarus*, to which is added a synonymical list of known species of *Cambarus* and *Astacus*. *Proc. Amer. Acad. Arts and Sci.* 20: 107-158.
- GIRARD, CHARLES. 1852. A revision of the North American Astaci with observations on their habits and geographical distribution. *Proc. Acad. Nat. Sci., Philadelphia* 6: 87-91.
- HAGEN, HERMANN A. 1870. Monograph of the North American Astacidae. *Illus. Cat. Mus. Comp. Zool., Harvard Coll.* (3): 1-109, 11 pls.
- HOBBS, HORTON H., JR. 1951. A new crayfish of the genus *Procambarus* from Louisiana, with a key to the species of the Spiculifer Group. *Journ. Wash. Acad. Sci.* 41(8): 272-276, 11 figs.
- . 1953. On the ranges of certain crayfishes of the Spiculifer Group of the genus *Procambarus*, with the description of a new species (Decapoda, Astacidae). *Journ. Wash. Acad. Sci.* 43(12): 412-417, 13 figs.
- . 1969. Two new species of the crayfish genus *Procambarus*

- (Decapoda, Astacidae) with keys to the members of the Spiculifer Group. Proc. Biol. Soc. Wash. 83: 329-348, 38 figs.
- LECONTE, JOHN. 1856. Descriptions of new species of *Astacus* from Georgia. Proc. Acad. Nat. Sci., Philadelphia 7: 400-402.
- PENN, G. H., JR. 1946. A new crawfish of the genus *Procambarus* from Louisiana. Journ. Wash. Acad. Sci. 36(1): 27-29, 6 figs.
- . 1953. Two new crawfishes of the genus *Procambarus* from Texas, Louisiana and Arkansas. Amer. Mus. Novitates (1636): 1-10, 19 figs.
- . 1963. A new crawfish from the Hatchie River in Mississippi and Tennessee (Decapoda, Astacidae). Proc. Biol. Soc. Wash. 76: 121-126, 10 figs.